

**Ultrasonic measurement of orbital and charge degrees of freedom in
 $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$**

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Perovskite manganite $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$ around $x = 0.5$ shows the charge ordering at T_{co} . It was reported that the orbital degree of freedom as the $d\gamma$ -doublet ($d(3z^2 - r^2)$, $d(x^2 - y^2)$) of $3d$ electron in Mn^{3+} ion and the charge degree of freedom as Mn^{3+} and Mn^{4+} ion are frozen simultaneously. Furthermore, $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$ exhibits the colossal magnetoresistance (CMR). In order to study the interplay of the CMR of $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$ to the orbital and charge degrees of freedom, we have measured the elastic constants in $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$ ($x = 0.35, 0.40, 0.50$). The elastic constant of $(C_{11} - C_{12})/2$ and C_{44} obviously shows softening above T_{co} for the compounds of $x = 0.35, 0.40$ and 0.50 in lowering temperature. When the concentration x of $\text{Pr}_{1-x}\text{Ca}_x\text{MnO}_3$ approaches to $x = 0.5$, the softening of $(C_{11} - C_{12})/2$ and C_{44} near T_{co} becomes more pronounced. This result means that the softening is caused by the charge fluctuation of $x = 0.5$ compound with $\text{Mn}^{3+} : \text{Mn}^{4+} = 1 : 1$. The softening of $(C_{11} - C_{12})/2$ and C_{44} in $x = 0.40$ and 0.50 compounds under magnetic fields is also presented.